

On the distribution of *Tarucus theophrastus* (FABRICIUS, 1793) (Papilionoidea, Lycaenidae) in Morocco.

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Summary

The distribution pattern of *Tarucus theophrastus* in Morocco is discussed. Two areas of increased population density have been found, one in the south and one in the north. There appears to be a positive inverse correlation between population density and altitude. The optimum altitude was found to be between 400 and 800 m.

Résumé

Dans ce travail, on étudie le modèle de distribution de *Tarucus theophrastus* au Maroc. La densité des peuplements est plus grande dans quelques régions de l'aire de distribution et diminue vers les limites de ces régions. La cause probable est un gradient d'élévation agissant comme facteur limitant.

Introduction

Tarucus theophrastus (FABRICIUS, 1793) is essentially an eremic species that flies from Southern Spain and Morocco through the arid Sahel zone of Africa to South-western Arabia, Dhofar (LARSEN, 1984) and Yemen (BALLETO & LARSEN, 1985). The records from India (see, however, KHATRI, 1987) the Middle East and Egypt are probably due to misidentifications (see BENJAMINI, 1983, 1984 and BALLETO & LARSEN, 1985).

In Morocco, the species is known from the north-eastern semi-arid zones (HIGGINS & RILEY, 1980) with a few records from Marrakech and Oukaïmeden in the High Atlas Mountains (HALL, 1986) and from Taroudant, Ait-Baha and Ait-Melloul on the southern slopes of these mountains (DE PRINS *et al.*, 1984 ; see also RUNGS, 1981).

The larvae feed on bushes and trees of *Zizyphus* sp., eating the leaves (one side only). In nature, the larvae are tended by ants in a symbiotic relationship, but in captivity they will develop satisfactorily without the attention of ants (LARSEN & LARSEN, 1980). The adults are always found near the

food-plant, around which they fly erratically, settling either on these or low shrubs nearby.

During a recent collecting trip (15th-30th May 1987) from northern to southern Morocco, 40 localities were visited, nine of which were occupied by populations of *T. theophrastus* (Fig. 1). It was the only butterfly to be found abundantly.

Methods & results

The standardized sampling method was based on a temporal unit effort — Each locality was sampled for 30 minutes.

All localities with *T. theophrastus* populations were of the same habitat type, consisting of open shrubland with *Zizyphus* bushes and some nitrophilic plants in the low vegetation strata (*Peganum harmala*, *Salsola vermiculata* and others, of the families *Salsolaceae* and *Zygophyllaceae*). This circumstance avoids any possible habitat effect on the variation of population densities.

In Table 1 the localities with *T. theophrastus* are summarized, giving their elevation, latitude and longitude as well as the number of individuals sampled in each of them. These data suggest an inverse correlation between the population density and altitude.

Locality	Altitude	Longitude	Latitude	Number of individuals
1. Taourirt	335	2° 10'	39° 30'	19
2. Mahirija	610	3° 31'	34° 5'	90
3. Meski	695	3° 46'	33° 43'	47
4. Missouri	860	4° 8'	33° 15'	39
5. Amersid	1160	4° 35'	32° 47'	18
6. Tarda	1110	4° 52'	31° 20'	29
7. El Hart	1210	6° 4'	31° 3'	25
8. Tizi-n-Taddert	1360	7° 10'	30° 52'	28
9. Ouarzazate	1380	7° 30'	30° 25'	10

Table 1. List of localities where *T. theophrastus* was caught with indication of the latitude, longitude, altitude as well as the number of individuals captured in each one.

Fig. 2 shows the range of distribution of *T. theophrastus* in Morocco based upon the density data from each of the nine localities sampled and upon the data (a) taken from DE PRINS *et al.* (1984). A core of high density is centred on the plains of the north-eastern semi-arid region whose altitude varies between 600 to 800 m. A reduction in the densities is observed towards the eastern slopes of the High Atlas Mountains where the *T. theophrastus* distribution is interrupted. Populations of this species appear again on the

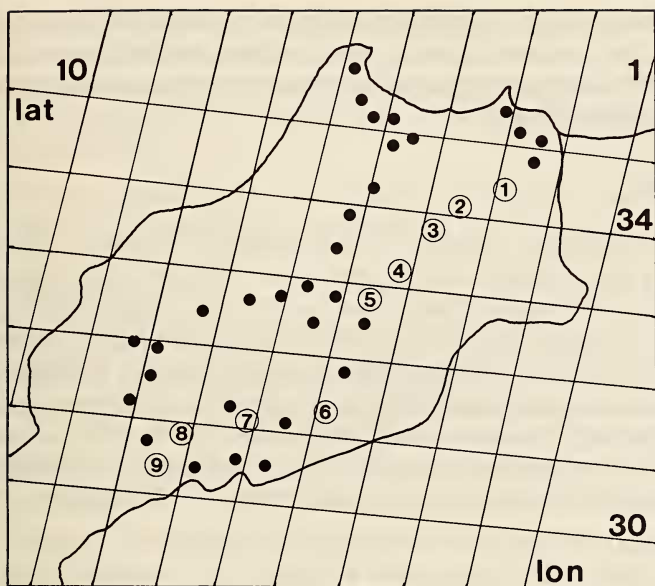


Fig. 1. Map of the localities visited. Those where *T. theophrastus* was present are numbered 1-9 (see Table 1).

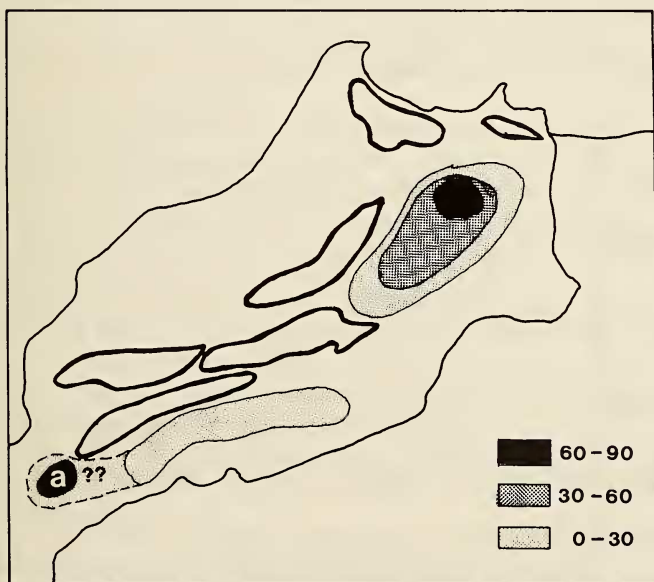


Fig. 2. Schematic representation of the distribution of *T. theophrastus* in Morocco, based upon my density data and the density data (a) of DE PRINS *et al.* (1984).

southern High Atlas Mountains, at greater altitudes, but also at lower densities. The southern populations of Ait-Baha, Ait-Belloul, etc. (DE PRINS *et al.*, 1984) are again more dense, because they are located at the lowest altitudes (about 400 m).

Discussion

How environmental conditions and population processes determine the abundance and distribution of a species is a central problem of ecology and biogeography. We are all aware that within their geographic ranges most species are relatively numerous in some habitats and regions, whereas they are scarce or absent in others. There is a general pattern of spatial variation in which the density is greatest near the center of the range and declines, usually gradually, towards the boundaries (see BROWN, 1984 and references therein). This pattern can be explained by geographically restricted gradients of environmental change such as elevation (see i.e. WHITTAKER, 1960).

The distribution range of *T. theophrastus* in Morocco is, obviously, limited by the presence of its host-plant (*Zizyphus* sp.). However, the different densities found among the populations can be explained by the various altitudes.

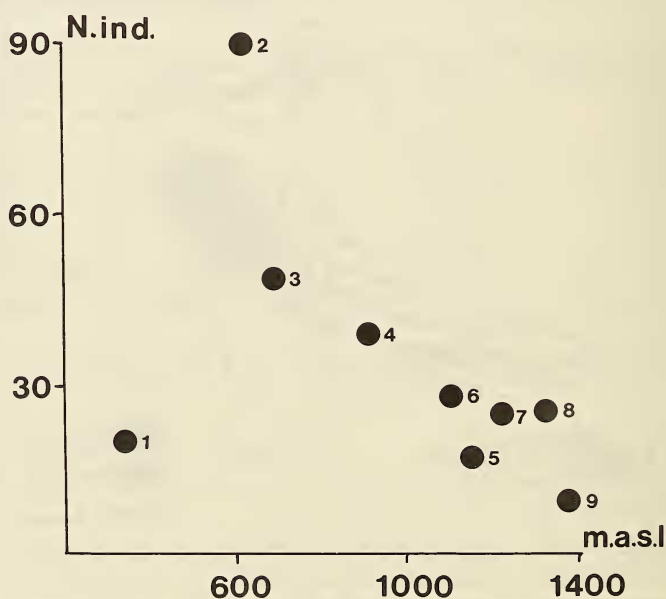


Fig. 3. Correlation between the altitude and the number of individuals captured.

T. theophrastus has, in Morocco, two cores of high density centred in the north-eastern and south-western regions. From these points, the population density decreases in all directions. The principal limiting factor seems to be the high altitudes (Fig. 3) – the presence of mountains causes a disjunct distribution (Fig. 2).

This hypothesis is reinforced by the apparent absence of *T. theophrastus* in southern Morocco above 1000 m (see BOZANO & GIACOMAZZO, 1988).

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